Missouri Department of Natural Resources

Biological Assessment Report

Hinkson Creek Macroinvertebrate Community Assessment
Year 1: Spring & Fall 2012

Boone County, Missouri

January 31, 2013

Prepared for:

Missouri Department of Natural Resources
Division of Environmental Quality
Water Protection Program
Water Pollution Branch

Prepared by:

Missouri Department of Natural Resources
Division of Environmental Quality
Environmental Services Program
Water Quality Monitoring Section

Table of Contents

Section			Page
1.0	Introduction		1
2.0	Study Area		1
3.0	Site Descriptions		3
4.0	Methods		5
	4.1	Macroinvertebrate Collection and Analyses	5
	4.2	Physicochemical Data Collection and Analysis	7
	4.3	Quality Assurance/Quality Control (QA/QC)	8
		4.3.1 Field Meters	8
		4.3.2 Biological Samples	8
		4.3.3 Biological Data Entry	8
5.0	Results		8
	5.1	Physicochemical Data	8
	5.2	Biological Assessment	11
		5.2.1 Hinkson Creek Longitudinal Comparison	11
		5.2.2 Comparison of Hinkson and Bonne Femme Creeks	14
		5.2.3 Comparison of 2012 Data and Historical Data	15
6.0	Discussion		18
7.0	Recommendations		19
8.0	References Cited		20

Tables

Table 1	Spring 2012 Flow and *In situ* Water Quality Measurements	9
Table 2	Fall 2012 Flow and *In situ* Water Quality Measurements	9
Table 3	Spring 2012 Nutrient and Chloride Concentrations	10
Table 4	Fall 2012 Nutrient and Chloride Concentrations	11
Table 5	Biological Criteria for Warm Water Reference Streams in the Ozark/Moreau/Loutre EDU, Spring	11
Table 6	Biological Criteria for Warm Water Reference Streams in the Ozark/Moreau/Loutre EDU, Fall	12
Table 7	Metric Values and Scores for Hinkson and Bonne Femme Creek Stations, Spring 2012, Using Ozark/Moreau/Loutre Biological Criteria	12
Table 8	Metric Values and Scores for Hinkson Creek Stations, Fall 2012, Using Ozark/Moreau/Loutre Biological Criteria	13
Table 9	MSCI Scores in Samples from All Stations on Hinkson Creek, Fall 2001 - Fall 2012	16
Table 10	Mean Values for Individual MSCI Metrics at Rural and Urban Hinkson Creek Stations, Fall 2001 – Spring 2012	17

Figures

Figure 1 The General Study Area, Illustrating the Locations of Hinkson Creek and Bonne Femme Creek, in Relation to the City of Columbia, and to Each Other 2

Figure 2 Hinkson Creek Sampling Stations for the 2012 Study 4

Figure 3 Bonne Femme Creek Sampling Stations for the 2012 Study 6

Figure 4 Mean Taxa Richness at Upper HC, Lower HC, and BFC, Spring 2012 14

Figure 5 Mean EPT Richness, Biotic Index, and Shannon Diversity at Upper HC, Lower HC, and BFC, Spring 2012..... 15

Attachments

Appendix A Hinkson Creek and Bonne Femme Creek Macroinvertebrate Taxa Lists

1.0 Introduction

In 1998 the Missouri Department of Natural Resources (**MDNR**) placed approximately 14 miles of Hinkson Creek (Boone County) on its list of impaired waters designated under Section 303(d) of the Clean Water Act. In the Total Maximum Daily Load (**TMDL**) document prepared for this watershed, the pollutant(s) causing the impairment were listed as unknown, and the sources of this pollution are listed as "urban runoff" and "urban nonpoint source" (USEPA 2011). As an alternative to the strict adherence to the requirements outlined in the TMDL, a collaborative adaptive management plan was developed among the stakeholders that included the city of Columbia, Boone County, the University of Missouri-Columbia, Region VII of the United States Environmental Protection Agency (**USEPA**), and MDNR, among other entities. As a partner in the collaborative adaptive management process, MDNR agreed to conduct a three-year biological study of Hinkson Creek beginning in 2012.

Agricultural and urban land uses predominate in the Hinkson Creek watershed, and have likely resulted in increased sedimentation in the system, removal of riparian buffer vegetation, and alteration of the natural hydrology of the stream (Lenat and Crawford 1994; Paul and Meyer 2001). Several studies of the physical, chemical, and biological conditions of the creek have presented evidence of stream degradation in various segments of the stream (Parris 2000; MDNR 2002, 2004, 2005, 2006; Nichols 2012). In 34 macroinvertebrate samples collected from Hinkson Creek between fall 2001 and spring 2006, 14 were classified as only partially supporting of aquatic life. The majority of these (12 of 14, or 86%) were collected in the portion of the stream downstream of the I-70 crossing to the Columbia city limit just downstream of the Scott Boulevard crossing. These samples represent the subset of the Hinkson Creek macroinvertebrate community considered to be within an urban setting; upstream of the I-70 crossing the creek is within a rural – primarily agricultural – setting.

2.0 Study Area

The geographical relationship of Hinkson Creek – the study stream – and Bonne Femme Creek – the control stream – and their locations relative to the city of Columbia, are illustrated in Figure 1. Hinkson Creek originates northeast of Hallsville in Boone County, and flows approximately 26 miles in a southwesterly direction to its entrance into Perche Creek (Figure 2). It is classified as a permanent stream for the lower 6 miles, and an intermittent stream upstream of the Highway 163 (Providence Road) crossing. Land use in the approximately 89 mi^2 watershed is 20.7% urban, 11.5% cropland, 38.2% grassland, and 26.9% forest, with the remainder consisting of open water and barren surfaces (MoRAP 2005). Hinkson Creek is considered a Missouri Ozark border stream and is in the transitional zone between the Glaciated Plains to the north and the Ozark Highlands to the south (Thom and Wilson 1980). It is located in the Ozark/Moreau/Loutre ecological drainage unit (**EDU**). Thus, its bioassessment results were compared to reference streams considered to represent the best attainable biological conditions of this EDU.

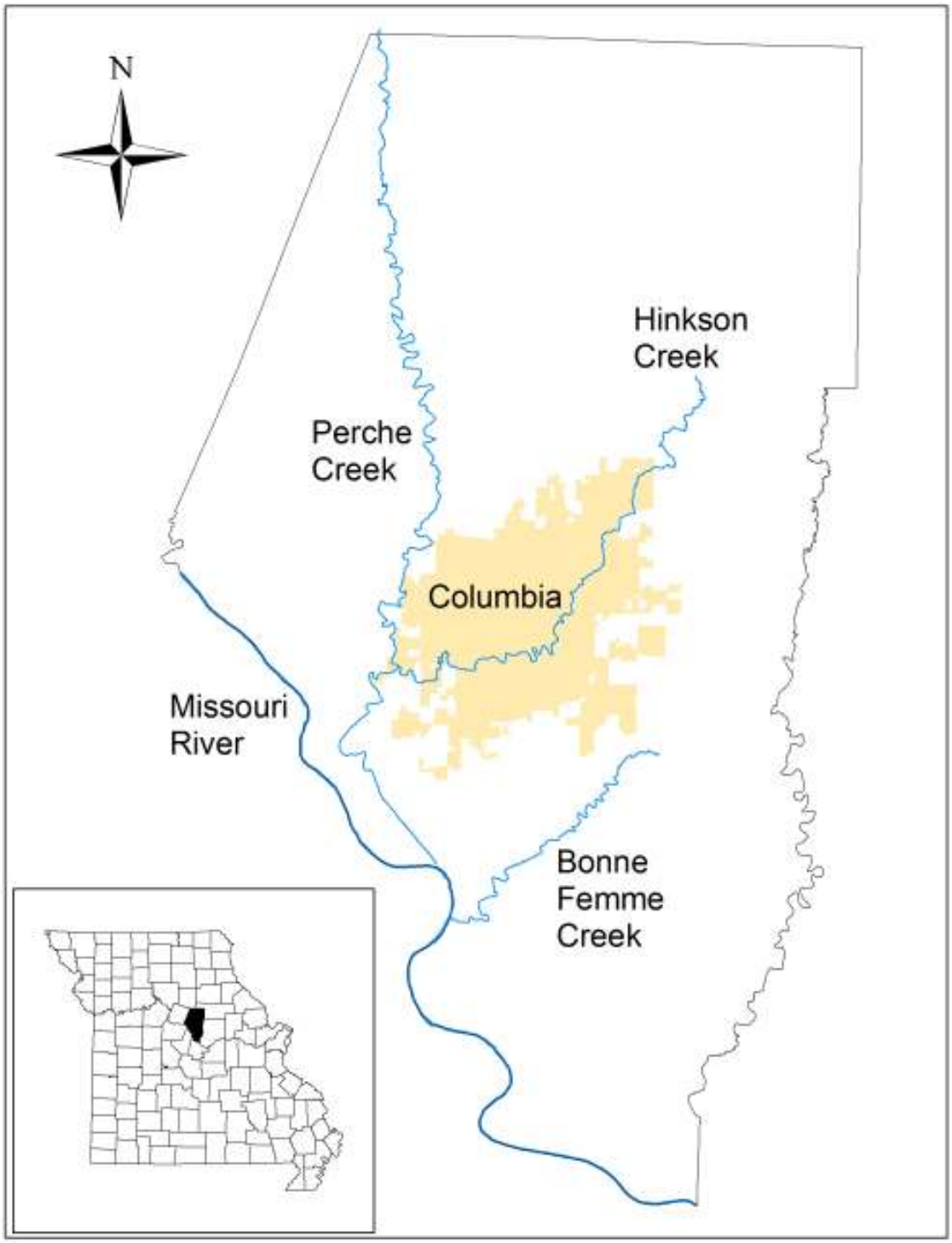


Figure 1. The General Study Area, Illustrating the Locations of Hinkson and Bonne Femme Creeks in Relation to the City of Columbia, and to Each Other.

In this study, the biological and habitat quality conditions of Hinkson Creek were also compared to those of Bonne Femme Creek. This stream is more similar in size to Hinkson Creek than are the larger biocriteria reference streams. Bonne Femme Creek originates southeast of Columbia in Boone County, and flows in a southwesterly direction to its entrance into the Missouri River (Figure 3). Within the study area, it is classified as a permanent stream. Land use in its approximately 51 mi^2 watershed is 3% urban, 22% cropland, 34% grassland, and 36% forest (MoRAP 2005). It is also in the Ozark/Moreau/Loutre EDU, and was chosen as a control stream because its watershed is similar in area to the middle and upper segments of Hinkson Creek, but with minimal urbanization.

3.0 Site Descriptions

All of the following sample sites were in Boone County, Missouri.

Hinkson Creek Station #1 (SE ¼ sec. 29, T. 48 N., R. 13 W.) was located downstream of the Scott Boulevard bridge (Figure 2). Geographic coordinates at the upstream terminus of the station were UTME 551970, UTMN 4307414.

Hinkson Creek Station #2 (NW ¼ sec. 27, T. 48 N., R. 13 W.) was located upstream of the MKT Trail bridge in the vicinity of Twin Lakes Recreational Area. Geographic coordinates at the upstream terminus of this station were UTME 553966, UTMN 4308301.

Hinkson Creek Station #3 (NE ¼ sec. 27, T. 48 N., R. 13 W.) was located downstream of the Forum Boulevard bridge. Geographic coordinates of the upstream terminus of the station were UTME 555061, UTMN 4308249.

Hinkson Creek Station #3.5 (SW ¼ sec. 24, T. 48 N., R. 13 W.) was located upstream of the Recreation Drive culvert crossing (just east of Providence Road). Geographic coordinates of the downstream terminus of the station were UTME 557571, UTMN 4309043.

Hinkson Creek Station #4 (NW ¼ sec. 19, T. 48 N., R. 12 W.) was downstream of the Rock Quarry Road bridge. Geographic coordinates of the downstream terminus of the station were UTME 558533, UTMN 4309388.

Hinkson Creek Station #5 (NW ¼ sec. 8, T. 48 N., R. 12 W.) was located upstream of the most upstream footbridge of Capen Park. Geographic coordinates of the upstream terminus of the station were UTME 559135, UTMN 4309518.

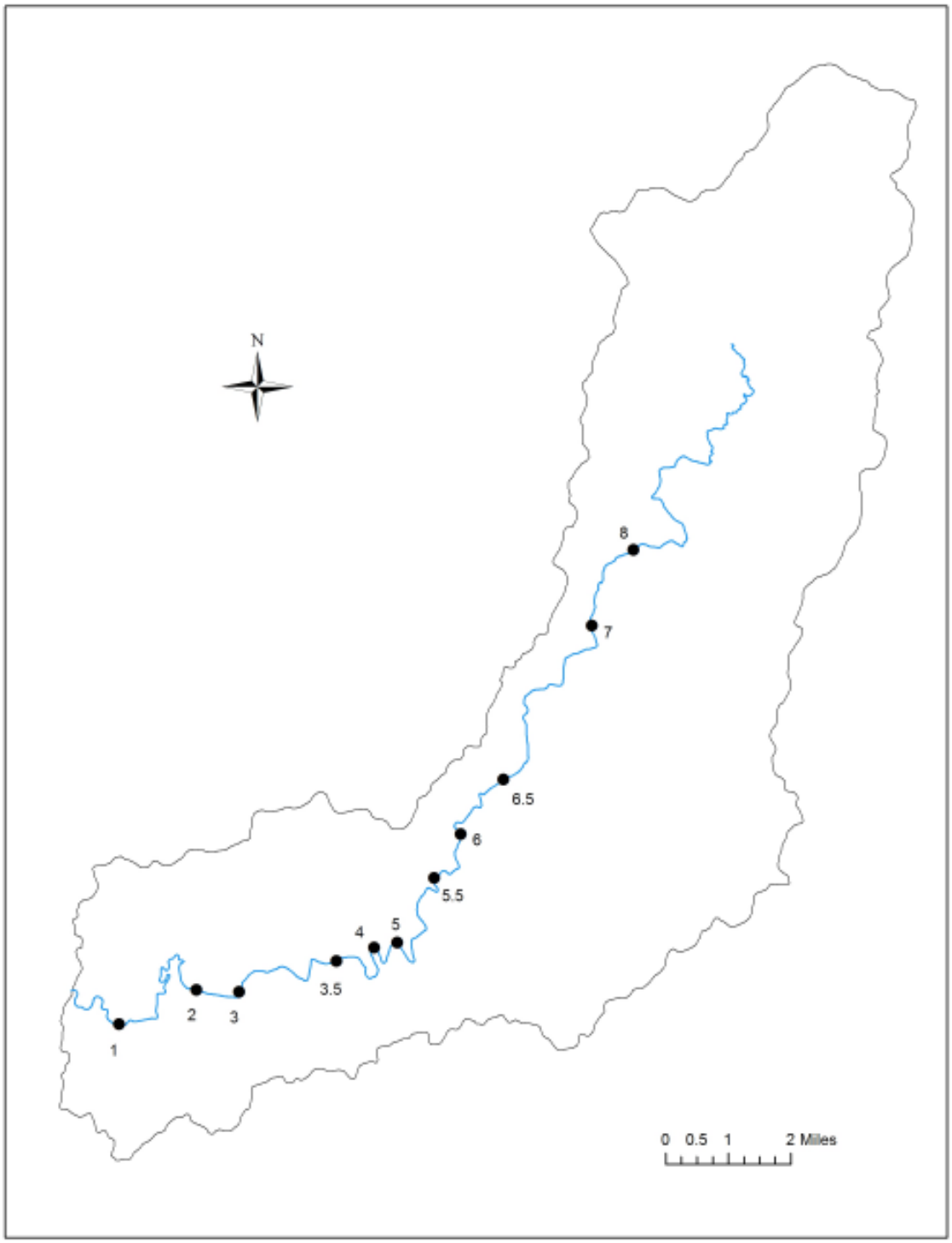


Figure 2. Hinkson Creek Sampling Stations for the 2012 Study. The black line delineates the watershed boundary.

Hinkson Creek Station #5.5 (NE ¼ sec. 18, T. 48 N., R. 12 W.) was located downstream of the Green Valley Drive bridge (just south of Broadway Street). Geographic coordinates of the upstream terminus of the station were UTME 560081, UTMN 4311180.

Hinkson Creek Station #6 (SW ¼ sec. 8, T. 48 N., R. 12 W.) was located upstream from the East Walnut Street bridge. Geographic coordinates of the downstream terminus of the station were UTME 560767, UTMN 4312309.

Hinkson Creek Station #6.5 (SE ¼ sec. 5, T. 48 N., R. 12 W.) was located upstream of the Highway 63 connector (upstream of the trailer park east of the connector and behind Home Depot). Geographic coordinates in the downstream portion of the station were UTME 561861, UTMN 4313714.

Hinkson Creek Station #7 (NW ¼ sec. 27, T. 49 N., R. 12 W.) was located upstream of the Hinkson Creek Road/Wyatt Lane bridge. Geographic coordinates at the upstream terminus of the station were UTME 564140, UTMN 4317670.

Hinkson Creek Station #8 (SE ¼ sec. 15, T. 49 N., R. 12 W.) was located downstream of the Rogers Road bridge. Geographic coordinates at the downstream terminus of the station were UTME 565212, UTMN 4319627.

Bonne Femme Creek Station #1 (SE ¼ sec. 25, T. 47 N., R. 13 W.) was located downstream of the Nashville Church Road bridge (Figure 3). Geographic coordinates at the upstream terminus of the station were UTME 558176, UTMN 4297283.

Bonne Femme Creek Station #2 (SW ¼ sec. 30, T. 47 N., R. 12 W.) was located upstream of the Nashville Church Road bridge. Geographic coordinates at the downstream terminus of the station were UTME 558176, UTMN 4297283.

4.0 Methods

4.1 Macroinvertebrate Collection and Analyses

The survey periods for this study were April 3 and October 9-10, 2012. Sam McCord, Mike Irwin, and Dave Michaelson collected macroinvertebrate samples during the spring sample season. Michael Giovanini and Raissa Espejo collected the water chemistry grab samples during this period. In the fall, Sam McCord and Dave Michaelson collected macroinvertebrate samples and Mike Irwin collected water chemistry samples. A standardized sample collection procedure was followed as described in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (**SMSBPP**) (MDNR 2010d). Three standard habitats—flowing water over coarse substrate (riffles and runs), depositional substrate in non-flowing water (pools), and rootmat at the stream edge—were generally sampled at all locations. The exception in the 2012 survey period

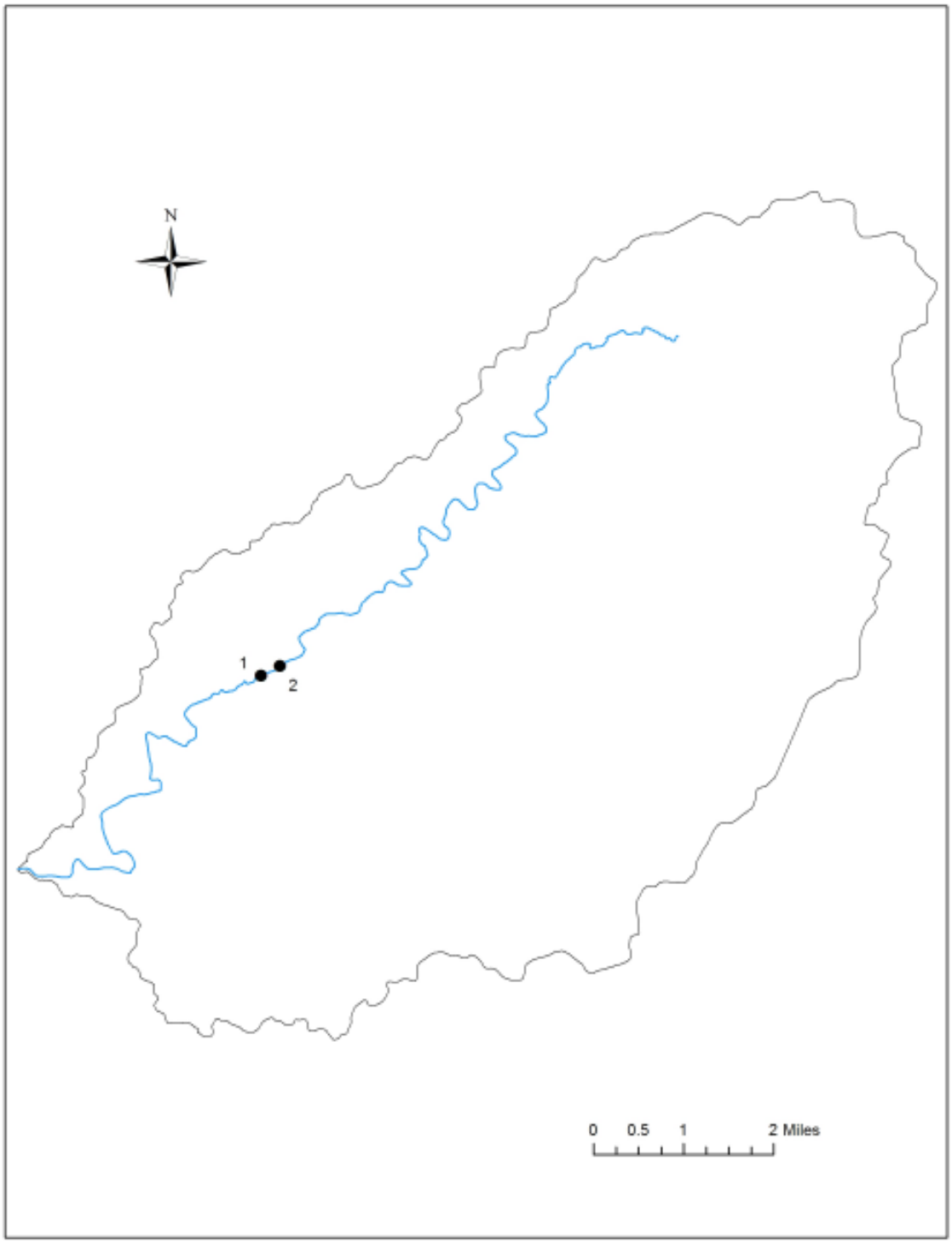


Figure 3. Bonne Femme Creek Sampling Stations for the 2012 Survey. The black line delineates the watershed boundary.

was Hinkson Creek Station 6, where rootmat habitat was too scarce to provide a sample in the fall. Hinkson Creek Stations 1, 2, and 3 were not sampled in the spring. On April 1, 2012, a fish kill occurred on Flat Branch Creek, which is a tributary of Hinkson Creek that enters just upstream of the stations mentioned. The event was attributable to firefighting activities that caused water contaminated with automotive chemicals and products of combustion to drain into the tributary. Additionally, Hinkson Creek Stations 6.5, 7, and 8, and Bonne Femme Creek Stations 1 and 2, were not analyzed in the fall. Drought conditions in the region caused these locations to consist only of isolated pools rather than flowing systems.

Laboratory processing was consistent with the description in the SMSBPP (MDNR 2010d). Each sample was processed under 10x magnification to remove a habitat-specific target number of individuals from debris. Individuals were identified to standard taxonomic levels (MDNR 2012e) and enumerated.

A standardized sample analysis procedure was followed as described in the SMSBPP. The following four metrics were used: 1) Taxa Richness (**TR**); 2) total number of taxa in the orders Ephemeroptera, Plecoptera, and Trichoptera (**EPTT**); 3) Biotic Index (**BI**); and 4) Shannon Diversity Index (**SDI**). These metrics were scored and combined to form the Macroinvertebrate Stream Condition Index (**MSCI**). Macroinvertebrate Stream Condition Index scores of 16-20 qualify as fully supporting, 10-14 are partially supporting, and 4-8 are considered non-supporting of the protection of warm water aquatic life beneficial use designation as specified in the Missouri Water Quality Standards (MDNR 2012d). The macroinvertebrate data, separated by habitat, are included in Appendix A as laboratory bench sheets.

Macroinvertebrate data were examined in the following ways: 1) longitudinal comparisons were made among Hinkson Creek (**HC**) reaches to address differences between rural (Stations 6.5, 7, and 8) and urban (Stations 1 – 6) segments of the creek; 2) rural and urban HC stations were compared to Bonne Femme Creek (**BFC**) stations; and 3) data from HC stations sampled in 2012 were compared to those obtained from HC in previous years.

4.2 Physicochemical Data Collection and Analysis

During each survey period, *in situ* water quality measurements were collected at all stations. At Bonne Femme Creek, measurements were taken at a single site between the two longitudinally adjacent macroinvertebrate survey stations. Water quality parameters were measured *in-situ* or collected and returned for analyses at the state environmental laboratory. Temperature (^{o}C) (MDNR 2012f), pH (MDNR 2012b), specific conductance (µS/cm) (MDNR 2012g), and dissolved oxygen (mg/L) (MDNR 2012c) were measured in the field. Turbidity (NTU) (MDNR 2010b) was measured and recorded in the Environmental Services Program (**ESP**), Water Quality Monitoring Section (**WQMS**) biology laboratory. Additionally, water samples were collected and analyzed by ESP's Chemical Analysis Section for chloride, total phosphorus, ammonia-N, nitrate+nitrite-N,

total nitrogen, and non-filterable residue (all parameters reported in mg/L). Procedures outlined in Field Sheet and Chain-of-Custody Record (MDNR 2010c) and Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations (MDNR 2011) were followed when collecting water quality samples.

Stream velocity was measured at each station where practicable during the study using a Marsh-McBirney Flo-Mate™ Model 2000 flow meter. Discharge was calculated per the methods in the Standard Operating Procedure MDNR-ESP-113, Flow Measurement in Open Channels (MDNR 2010e).

Physicochemical data were summarized and presented in tabular form for comparison among HC stations, and also to compare between HC stations and Bonne Femme Creek (**BFM**) stations.

4.3 Quality Assurance/Quality Control (QA/QC)

4.3.1 Field Meters

All field meters used to collect water quality parameters were maintained in accordance with the Standard Operating Procedure MDNR-ESP-213, Quality Control Procedures for Checking Water Quality Field Instruments (MDNR 2010a).

4.3.2 Biological Samples

Steps to assure accuracy of organism removal from sample debris were performed consistent with those methods found in the SMSBPP document (MDNR 2010d).

4.3.3 Biological Data Entry

All macroinvertebrate data were entered into the WQMS macroinvertebrate database consistent with the Standard Operating Procedure MDNR-ESP-214, Quality Control Procedures for Data Processing (MDNR 2012a).

5.0 Results

5.1 Physicochemical Data

Stream flow and *in situ* water quality data for this study are presented in Tables 1 and 2. As expected, discharge increased from upstream to downstream HC stations. Flow was 10 – 20 times greater in the spring than in the fall. In the spring, discharge at BFC was comparable to that of the upper stations at HC (see Table 1). In the fall, flow ceased at the three uppermost HC stations and at both BFC stations, and the stream segments consisted of isolated pools. Variation in water temperature was primarily seasonal, with mean levels among stations being 20.0°C in spring and 11.8°C in the fall. Temperature

differed to a lesser extent with the time of day that the readings were taken (i.e., increasing from morning to afternoon). Dissolved oxygen (**DO**) concentrations were somewhat higher in the fall (mean = 9.9 mg/L) than in the spring (8.4). As with temperature, DO levels generally increased from morning to afternoon within survey periods. Conductivity values were consistently higher in fall samples (mean = 648 µS/cm) than in the spring (464). Similarly, pH levels were higher in the fall than in the spring (see Tables 1 and 2). Turbidity values were comparable among seasons (mean = 3.14 NTU in fall vs. 2.72 in the spring). Longitudinal patterns in HC water quality variables were only noted in the spring, when conductivity increased, and turbidity decreased, from upstream to downstream sites. Differences in water quality variables between BFC and HC were also noted in spring. DO and turbidity levels were higher, whereas conductivity was lower in BFC.

Table 1
Spring 2012 Flow and *In situ* Water Quality Measurements

	Parameter					
Station	Flow (cfs)	Temperature (°C)	Dissolved O_2 (mg/L)	Conductivity (µS/cm)	pH	Turbidity (NTU)
HC 8	2.0	20.0	8.59	378	8.0	3.74
HC 7	2.2	19.7	8.36	416	7.9	3.11
HC 6.5	5.5	19.7	7.90	477	7.9	2.73
HC 6	7.6	20.2	7.86	490	8.0	2.66
HC 5.5	8.3	19.5	7.32	494	7.8	2.12
HC 5	10.3	21.4	9.30	531	8.1	2.30
HC 4	10.6	20.4	9.13	533	8.1	1.86
HC 3.5	12.9	19.5	7.51	544	7.8	1.89
BFC 1	3.8	19.4	9.52	317	7.9	4.10

Table 2
Fall 2012 Flow and *In situ* Water Quality Measurements

	Parameter					
Station	Flow (cfs)	Temperature (°C)	Dissolved O_2 (mg/L)	Conductivity (µS/cm)	pH	Turbidity (NTU)
HC 6	<0.5	12.3	9.90	614	8.4	2.57
HC 5.5	<0.5	11.2	10.39	741	8.1	4.07
HC 5	<0.5	9.6	9.51	641	8.2	1.68
HC 4	<0.5	16.2	11.08	675	8.2	2.29
HC 3.5	0.57	13.7	9.65	655	8.1	4.74
HC 3	0.58	12.2	10.65	570	8.4	1.76
HC 2	1.18	9.9	9.38	634	8.2	4.11
HC 1	1.8	9.6	8.94	654	8.4	3.92

Nutrient and chloride concentrations are presented in Table 3 (spring 2012) and Table 4 (fall 2012). Non-filterable residue (total suspended solids) samples were also collected at all stations, but never exceeded laboratory detection limits. In the spring, total nitrogen and ammonia-nitrogen varied within relatively narrow ranges among HC and BFC stations. Total nitrogen levels were slightly greater at the three upper HC stations than at other sites. Ammonia-nitrogen levels were lower at BFC than at HC but no clear longitudinal pattern was evident at HC stations. Nitrate+nitrite-nitrogen levels were near or below detection limits (0.008 mg/L) at all HC stations, but were markedly higher (0.070 mg/L) at BFC. Total phosphorus concentrations were considerably greater at the three upper HC stations – particularly at HC 6.5 – than at the lower HC stations. Total phosphorus at BFC was intermediate compared to the upper and lower HC sites. Chloride levels increased from upper to lower HC stations, and were higher at all HC sites than at BFC.

In the fall, total nitrogen again did not vary substantially among HC stations and the remaining nutrient variables were generally near or below detection limits. Non-filterable residue samples were below detection limits at all sites. Chloride levels ranged from 47.6 to 71.7 mg/L, but did not conform to a clear longitudinal pattern (see Table 4). With regard to seasonal differences, chloride levels were consistently greater but nutrient levels were generally lower in the fall compared to the spring.

Table 3
Spring 2012 Nutrient and Chloride Concentrations

	Parameter (mg/L)				
Station	NH_3-N	NO_3+NO_2-N	Total Nitrogen	Total Phosphorus	Chloride
HC 8	0.062	<0.008*	0.50	0.140	17.5
HC 7	0.060	<0.008*	0.44	0.170	20.6
HC 6.5	0.041**	<0.008*	0.47	0.480	29.8
HC 6	0.046**	<0.008*	0.39	0.048**	33.9
HC 5.5	0.057	<0.008*	0.38	0.054	33.9
HC 5	0.064	<0.008*	0.40	0.025**	37.7
HC 4	0.049**	<0.008*	0.37	0.024**	39.1
HC 3.5	0.067	0.009**	0.35	0.025**	40.1
BFC 1	0.036	0.070	0.38	0.110	12.0

*Below detection limits: ** Estimated value, detected below Practical Quantitation Limit

Table 4
Fall 2012 Nutrient and Chloride Concentrations

	Parameter (mg/L)				
Station	NH_3-N	NO_3+NO_2-N	Total Nitrogen	Total Phosphorus	Chloride
HC 6	0.033	<0.008*	0.27	<0.01*	52.5
HC 5.5	<0.03*	0.02	0.28	<0.01*	71.7
HC 5	<0.03*	<0.008*	0.27	<0.01*	58.1
HC 4	<0.03*	<0.008*	0.21	<0.01*	51.9
HC 3.5	<0.03*	<0.008*	0.21	<0.01*	49.6
HC 3	0.032	0.02	0.24	<0.01*	47.6
HC 2	0.030	<0.008*	0.28	0.013**	53.2
HC 1	<0.03*	0.02	0.31	0.018**	60.8

*Below detection limits; **Estimated value, detected below Practical Quantitation Limit

5.2 Biological Assessment

5.2.1 Hinkson Creek Longitudinal Comparison

In the 2012 study year, comparisons between the upper (rural) and lower (urban) sites were limited by the exclusion of HC stations 1, 2, and 3 in the spring and stations 6.5, 7, and 8 in the fall. In the spring, the downstream stations were excluded to avoid effects of potentially hazardous materials described earlier, and the upstream stations were excluded in the fall due to drought-related low flow conditions. Macroinvertebrate community characteristics (metrics) at HC stations were compared to biocriteria derived from reference stream samples from the same EDU, which are presented in Table 5 (spring) and Table 6 (fall). In the spring, six of eight stations were fully supporting, with MSCI scores ranging from 14 at HC 6 and HC 3.5, to 18 at HC 8 (Table 7). All other stations scored 16; thus, there was no clear rural vs. urban trend in terms of score or aquatic life supporting status. The metrics that accounted for the differences in MSCI score were generally taxa richness (lower at HC 3.5) and Shannon diversity (lower at HC 6). Other than these instances, the taxa richness and diversity metrics scored 5 at all stations. EPT richness levels at all HC stations and biotic index values at all but one HC station received scores of 3.

Table 5
Biological Criteria for Warm Water Reference Streams in the Ozark/Moreau/Loutre EDU, Spring

	Score = 5	Score = 3	Score = 1
TR	>71	35-71	<35
EPTT	>17	9-17	<9
BI	<6.4	6.4-8.2	>8.2
SDI	>2.8	1.4-2.8	<1.4

Table 6
Biological Criteria for Warm Water Reference Streams in the Ozark/Moreau/Loutre EDU, Fall

	Score = 5	Score = 3	Score = 1
TR	>73	37-73	<37
EPTT	>15	7-15	<7
BI	<6.8	6.8-8.4	>8.4
SDI	>3.18	1.59-3.18	<1.59

Table 7
Metric Values and Scores for Hinkson Creek and Bonne Femme Creek Stations, Spring 2012, Using Ozark/Moreau/Loutre Biological Criteria

Site	TR	EPTT	BI	SDI	MSCI	Support
HC 8	77	15	6.2	3.04		
	5	3	5	5	18	Full
HC 7	72	10	6.4	3.09		
	5	3	3	5	16	Full
HC 6.5	81	12	6.7	3.30		
	5	3	3	5	16	Full
HC 6	72	12	6.4	2.75		
	5	3	3	3	14	Partial
HC 5.5	75	10	6.9	3.05		
	5	3	3	5	16	Full
HC 5	73	10	6.9	3.36		
	5	3	3	5	16	Full
HC 4	74	10	6.7	3.34		
	5	3	3	5	16	Full
HC 3.5	67	9	7.3	3.21		
	3	3	3	5	14	Partial
BFC 2	92	17	6.4	3.26		
	5	3	3	5	16	Full
BFC 1	88	19	6.2	3.38		
	5	5	5	5	20	Full

In the fall, all but one of the HC stations sampled had MSCI scores between 10 and 14, and were considered only partially supporting (Table 8). Only HC 5.5, with an MSCI score of 16, was considered fully supporting. At sites where seasonal comparisons were possible, levels of taxa richness and diversity were generally lower – and biotic index

scores were higher – in fall samples than those of spring. All eight stations scored 3 for both EPT richness and biotic index. It was not possible to compare rural and urban stations in the fall, as the former creek segments ceased flowing. However, it is probable that the low MSCI scores and partial aquatic life supporting status was associated with the persistent drought conditions in the summer and fall. Only HC 6 failed to achieve fully supporting status in both study periods.

Table 8
Metric Values and Scores for Hinkson Creek Stations, Fall 2012, Using Ozark/Moreau/Loutre Biological Criteria

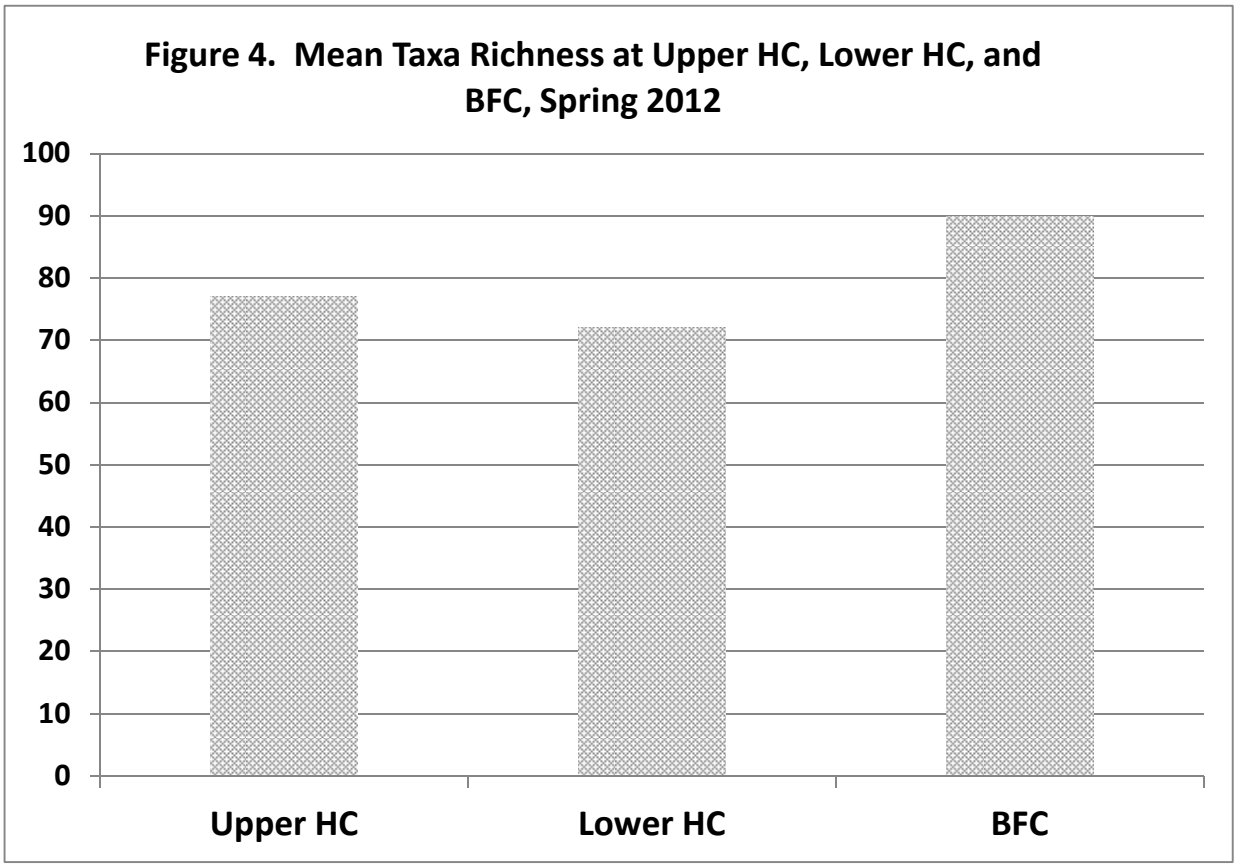
Site	TR	EPTT	BI	SDI	MSCI	Support
HC 6	60	10	7.4	2.51		
	3	3	3	3	12	Partial
HC 5.5	76	14	8.0	3.19		
	5	3	3	5	16	Full
HC 5	59	3	7.4	3.01		
	3	1	3	3	10	Partial
HC 4	63	11	7.5	2.58		
	3	3	3	3	12	Partial
HC 3.5	64	13	7.2	2.90		
	3	3	3	3	12	Partial
HC 3	71	12	7.5	2.82		
	3	3	3	3	12	Partial
HC 2	77	13	7.3	3.05		
	5	3	3	3	14	Partial
HC 1	67	11	7.0	3.38		
	3	3	3	5	14	Partial

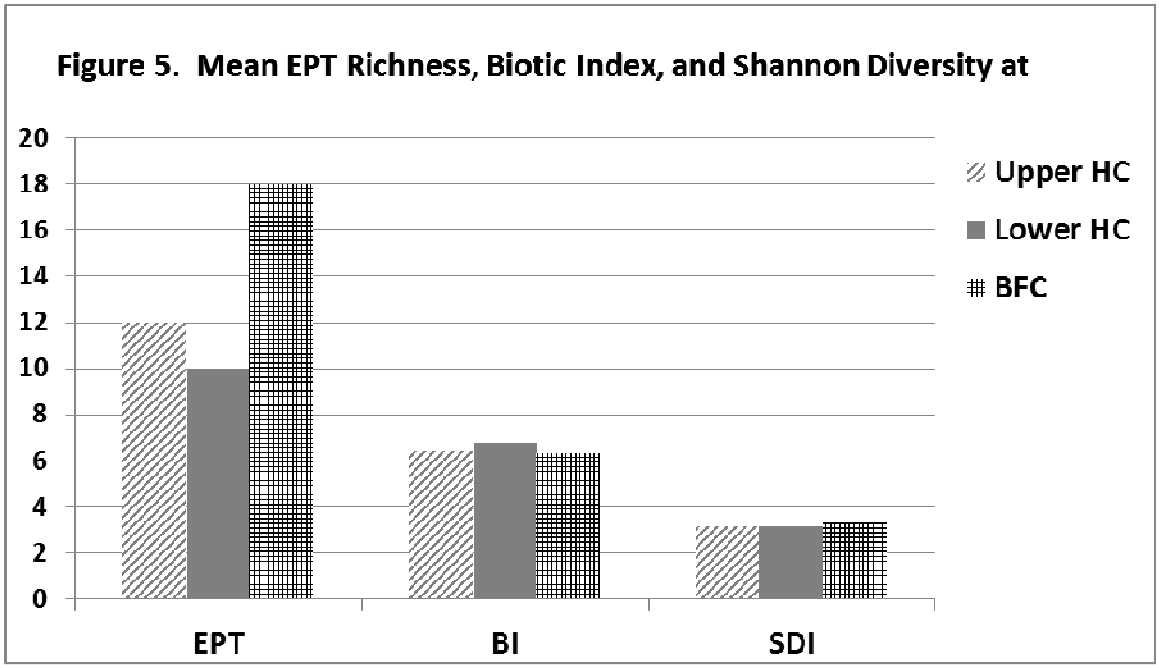
Compositionally, the macroinvertebrate communities were similar at all HC stations in each survey period. Spring samples were numerically dominated by chironomids (midges) – primarily members of the *Cricotopus/Orthocladius* group – and the blackfly *Simulium*. Other common or abundant taxa included tubificid worms, the snail *Physella*, the mayfly *Caenis latipennis*, the riffle beetle *Stenelmis*, and the additional chironomids *Chironomus* and *Stictochironomus* (see Appendix A). In the fall, *C. latipennis* was the numerical dominant at most sites. Tubificids, the snail *Menetus*, and *Stenelmis* were also consistently abundant throughout the study area. Collectively, chironomids accounted for much less of the community in the fall, but midge taxa that were consistently common and occasionally abundant included *Chironomus, Dicrotendipes*, and *Tanytarsus*.

5.2.2 Comparison of Hinkson and Bonne Femme Creeks

Macroinvertebrate data from BFC were only available for the spring. In that period, both BFC stations were considered fully supporting, with MSCI scores ranging from 16 to 20 (see Table 7). All three rural HC stations were fully supporting (MSCI range 16 – 18), whereas only three of the five urban HC stations were fully supporting (see Table 7). Taxa richness was greater at BFC sites (mean = 90) compared to upper HC (77) or lower HC (72) stations (Figure 4). Likewise, EPT richness was considerably higher at BFC (mean = 18) than at either upper HC (12) or lower HC (10) (Figure 5). Mean biotic index values were similar at BFC (mean = 6.3) and upper HC (6.4), but they were higher (6.8) at lower HC sites. Mean Shannon diversity was identical at upper HC and lower HC stations (3.14), but was greater at BFC (3.32).

Compositionally, a few of the same taxa numerically dominated BFC samples as HC samples. These included *Cricotopus/Orthocladius* and *Stenelmis* (see Appendix A). However, some differences among less common taxa were observed. For example, the stoneflies *Alloperla*, Chloroperlidae, and *Isoperla* were present in spring BFC samples but not at HC sites.





5.2.3 Comparison of 2012 Data and Historical Data

Macroinvertebrate surveys of Hinkson Creek have been performed by MDNR biologists on nine occasions between fall 2001 and fall 2012. Five studies were conducted in the spring and four in the fall. Due to study objectives or external circumstances (e.g., waste spill, drought), concurrent samples from multiple stations in the upper and lower HC segments were only taken on three occasions – fall 2001, spring 2002, and spring 2012. However, longitudinal patterns in MCSI scores, community characteristics (richness, diversity, pollution tolerance), and taxonomic composition were evident in even these few samples. Data from other study periods cover less geography of the stream, but can be used to test generalizations developed from the aforementioned surveys. Likewise, HC samples described in Nichols (2012) can be used for this purpose.

Since fall 2001, 12 macroinvertebrate samples have been collected from the upper (rural) HC study area. Ten of these (83%) had MSCI scores indicating full support of aquatic life (Table 9). The two that were only partially supporting were collected under low flow conditions (MDNR 2002), which likely had an inhibiting effect on assemblage richness and diversity. The middle and lower segments of the HC study area below the I-70 crossing are considered to be urban. From fall 2001 through fall 2012, a total of 38 macroinvertebrate samples have been collected from the urban segments of HC, with 17 (45%) having MSCI scores indicating fully supporting status (see Table 9). However, in six of the 38 original samples (Stations 4 and 5 in fall 2001, Stations 5 and 6 in spring

Table 9. MSCI Scores in Samples from All Stations on Hinkson Creek, Fall 2001 - Fall 2012.

Station	Land use segment	Fall 2001	Spring 2002	Fall 2003	Spring 2004	Spring 2005	Fall 2005	Spring 2006	Spring 2012	Fall 2012
HC 8 - Rogers Rd	Rural	12	18						18	
HC 7 - Hinkson Ck Rd	Rural	12	18	18	18	18	18		16	
HC 6.5 - Hwy 63 connector	Rural				16				16	
HC 6 - E Walnut St	Urban	12	12	16	14	18	18		14	12
HC 5.5 - Broadway	Urban			16	16	16	14		16	16
HC 5 - Upstr of Grindstone	Urban	16	12						16	10
HC 4 - Dnstr of Grindstone	Urban	18	14						16	12
HC 3.5 - Recreation Dr	Urban					14	14		14	12
HC 3 - Forum Blvd	Urban	18	14					16		12
HC 2 - Twin Lakes RA	Urban	18	14					14		14
HC 1 - Scott Blvd	Urban	16	14					16		14

Shaded cells indicate that the sample did not attain fully supporting status. Cross-hatched cells indicate that only 2 of 3 habitats were sampled.

2002, Station 5.5 in fall 2005, and Station 6 in fall 2012) only two of the three habitats were adequate to obtain a sub-sample (MDNR 2002, MDNR 2006, Appendix A).

Additionally, the eight samples in fall 2012 were collected under extremely low flow conditions following a summer-long drought. This almost certainly had a negative effect on HC assemblages, and may have been the primary factor in the low MSCI scores. Therefore, 13 of the 38 original samples were in one of these categories: 1) less than three habitats available or 2) taken in low flow conditions (HC 6 in fall 2012 was in both categories). If these 13 samples are subtracted from the total number of urban samples (38), a total of 25 samples remain. For these instances, in which samples that may have been affected by drought or habitat limitations are removed from consideration, 14 of 25 – or 56% – of urban HC samples were fully supporting.

In either case, it is evident that the macroinvertebrate communities in the urban segments of HC are impaired in comparison to the upper rural segment. In an effort to determine which community metrics were attributable for the lower scores, we compared the mean taxa richness, EPT richness, biotic index, and Shannon diversity values between rural and urban sites. For this comparison, we eliminated the problem samples described above for both rural and urban stations. This left ten rural and 25 urban samples to consider, with results summarized in Table 10. With regard to taxa richness levels, five fewer taxa, on average, were found in urban samples (73.2) compared to rural samples (78.2). Nearly all of this difference was accounted for by the difference in EPT richness, which averaged 14.5 taxa in rural samples and 9.7 in urban samples (see Table 10). Further, biotic index scores were generally higher in urban samples (mean = 7.0) than in those from rural stations (6.7). Shannon diversity, however, was similar between rural and urban sites, averaging 3.11 at both.

Table 10
Mean Values for Individual MSCI Metrics at Rural and Urban Hinkson Creek Stations, Fall 2001 – Spring 2012

Variable	Rural (HC 6.5, 7, and 8)	Urban (HC 1 – 6)
Taxa Richness	78.2	73.2
EPT Richness	14.2	9.7
Biotic Index	6.7	7.0
Shannon Diversity	3.11	3.11

Macroinvertebrate assemblages were compositionally similar between rural and urban HC sites in terms of common and abundant taxa (MDNR 2002, 2004, 2005, 2006; Appendix A). The primary source of variation among samples was seasonal. Spring samples were nearly always dominated numerically by the chironomid group *Cricotopus/Orthocladius*; other consistently abundant community members included tubificid worms, the mayfly *Caenis latipennis*, and the riffle beetle *Stenelmis*. Other taxa

that were always common and occasionally abundant included the mayfly *Stenonema femoratum* and the chironomids *Hydrobaenus*, *Paratanytarsus*, and *Stictochironomus*. Fall samples were generally dominated by *C. latipennis* and/or *Stenelmis*. Other consistently common and occasionally abundant taxa included tubificids, the pond snail *Physella*, the riffle beetle *Dubiraphia*, and the chironomids *Ablabesmyia*, *Polypedilum convictum* grp., and *Tanytarsus*.

Other less common taxa exhibited greater differences between rural and urban sites. For example, the caddisfly *Cheumatopsyche* was more numerous downstream in fall surveys. Stoneflies – primarily represented by *Amphinemura*, *Isoperla*, and *Perlesta* – were never abundant but were consistently present in spring surveys. This group was clearly more numerous in samples from rural stations than in those of urban sites, and was rarely encountered downstream of HC 5.5 (near the Broadway crossing).

6.0 Discussion

Water quality surveys at HC and BFC in 2012 did not reveal numerous clear differences between streams, nor between rural and urban segments of HC. *In situ* measurements primarily varied between seasons. The only variable that exhibited a potentially impairment-related spatial pattern was conductivity, which increased from upstream to downstream stations in HC and was greater at all HC stations than in BFC. This pattern was evident only in the spring. In terms of water chemistry variables, nutrient and non-filterable residue levels did not conform to consistent longitudinal or between-streams patterns. Total phosphorus concentration was markedly greater in samples from rural HC and BFC stations than from urban HC sites.

In the spring, chloride levels consistently increased from upstream to downstream HC stations and were greater at all HC stations than at BFC, a trend that had been noted in other studies (MDNR 2002, 2004, 2005, 2006; Nichols 2012). It was not possible to make the same comparisons in the fall, however, because the BFC study area and the upper stations of the HC study area had ceased flowing.

In the 2012 study, comparisons between the rural and urban HC stations were limited by the exclusion of HC 1, 2, and 3 in the spring – due to a spill of potentially hazardous materials – and HC 6.5, 7, and 8 and BFC 1 and 2 in the fall – due to drought-related low flow conditions. Even so, some longitudinal and inter-creek variation was evident. In the spring, MSCI scores at all rural HC stations and both BFC stations were above the fully supporting threshold score. Among urban HC sites, three of five stations were fully supporting. In the fall, in which only urban HC sites were sampled, only one of eight stations was fully supporting. Drought-related low flow conditions may have substantially affected these sites, however, and it is debatable whether this pattern observed in fall 2012 constitutes evidence of an urban effect on the stream (Lake 2000).

Macroinvertebrate assemblage composition at rural and urban sites on HC is relatively similar in terms of numerically dominant taxa. This trend was also evident in previous surveys on the stream (MDNR 2002, 2004, 2005, 2006; Nichols 2012). Notable compositional trends in both 2012 and earlier studies was the greater abundance of tubificid worms and decreased presence of stoneflies at urban HC sites relative to rural HC and BFC sites. These differences are at least partly associated with the greater relative abundance of depositional substrates at the most downstream HC stations. The question remains whether this greater degree of fine substrate results from natural hydrogeological processes as opposed to reversible or mitigatable activities related to the urban setting (Nichols 2012).

HC is a difficult system in which to find stations with similar physical characteristics and habitat characteristics in the upper, middle, and lower segments of the stream. Bedrock is prevalent in the upper and middle segments, but not in the lower segment. Flow permanence is greater in the lower segment, but riffle complexes are farther apart. With regard to habitats, flow over coarse substrate is predominant in the upper and middle segments whereas deep pools with depositional substrates are relatively scarce. The reverse of the above is true for the lower segment of the creek. Rootmat habitat is patchy throughout the system, and it has been consistently problematic in trying to obtain similar sample volumes of rootmat among stations.

Despite these caveats for the interpretation of HC biological data, it appeared that there was some reduction in the quality of the macroinvertebrate community downstream of the I-70 crossing, and that this condition persisted through the downstream extent of the study area. Potential sources of impairment identified in previous reports concerning HC include stormwater runoff from a variety of locations, runoff of de-icing agents, petroleum compounds, and other chemicals from I-70 and other roadways, periodic sewage bypasses, and spills of hazardous materials such as that which occurred in early April 2012. Added to these are the effects of construction/development activities performed either with best management practices lacking or inadequate to protect the adjacent stream. An example of this was the construction activity observed at the Columbia Country Club golf course, which borders approximately half of HC 6, in 2012. Riparian buffers had been removed during these activities, resulting in the introduction of sediment into HC at this point. This general area has been and apparently continues to be a chronic source of factors that may be linked to impairment in this reach (MDNR 2002, 2004, 2005, 2006).

7.0 Recommendations

1. Promote planting of trees to establish and expand/improve riparian areas along HC.

2. Ensure that minimal effects occur during development through consistent enforcement of established city and county best management practice guidelines. These efforts are especially critical when the activities are adjacent to the creek.

3. Identify areas in which stormwater detention basins would be most effective and construct them in priority locations.

4. Continue promoting volunteer activities such as stream clean-ups and water quality monitoring.

5. Continue periodic biological monitoring of HC to document the present condition of the macroinvertebrate community that will serve to verify any future changes.

8.0 References Cited

Lake, P.S. 2000. Disturbance, patchiness, and diversity in streams. Journal of the North American Benthological Society 19:573-592.

Lenat, D.R. and J.K. Crawford. 1994. Effects of land use on water quality and aquatic biota of three North Carolina Piedmont streams. Hydrobiologia 294:185-199.

MDNR. 2002. Biological Assessment Report: Hinkson Creek, Boone County. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 29 pp.

MDNR. 2004. Hinkson Creek Stream Study (Phase I), Columbia, Missouri. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 61 pp.

MDNR. 2005. Phase II Hinkson Creek Stream Study, Columbia, Missouri. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 42 pp.

MDNR. 2006. Phase III Hinkson Creek Stream Study, Columbia, Missouri. Missouri Department of Natural Resources, Environmental Services Program, Jefferson City, MO. 38 pp.

MDNR. 2010a. Standard Operating Procedure MDNR-ESP-213: Quality Control Procedures for Checking Water Quality Field Instruments. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 12 pp.

MDNR. 2010b. Standard Operating Procedure MDNR-ESP-012: Analysis of Turbidity Using the Hach 2100P Portable Turbidimeter. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 8 pp.

MDNR. 2010c. Standard Operating Procedure MDNR-FSS-002: Field Sheet and Chain-of-Custody Record. Missouri Department of Natural Resources, Environmental Services Program, Jefferson City, MO. 8 pp.

MDNR. 2010d. Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 24 pp.

MDNR. 2010e. Standard Operating Procedure MDNR-FSS-113: Flow Measurements in Open Channels. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 9 pp.

MDNR. 2011. Standard Operating Procedure MDNR-ESP-001: Required/ Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 21 pp.

MDNR. 2012a. Standard Operating Procedure MDNR-WQMS-214: Quality Control Procedures for Data Processing. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 6 pp.

MDNR. 2012b. Standard Operating Procedure MDNR-ESP-100: Field Analysis of Water Samples for pH. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 8 pp.

MDNR. 2012c. Standard Operating Procedure MDNR-ESP-103: Sample Collection and Field Analysis for Dissolved Oxygen Using a YSI Membrane Electrode Meter, Hach HQ40d LDO Probe, or YSI Pro ODO Probe. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 16 pp.

MDNR. 2012d. Title 10. Rules of Department of Natural Resources Division 20-Clean Water Commission, Chapter 7-Water Quality. 10 CSR 20-7.031 Water Quality Standards. pp. 10-136.

MDNR. 2012e. Standard Operating Procedure MDNR-WQMS-209: Taxonomic Levels for Macroinvertebrate Identification. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 30 pp.

MDNR. 2012f. Standard Operating Procedure MDNR-ESP-101: Field Measurement of Water Temperature. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 3 pp.

MDNR. 2012g. Standard Operating Procedure MDNR-ESP-102: Field Analysis of Specific Conductance. Missouri Department of Natural Resources, Environmental Services Program. Jefferson City, MO. 9 pp.

Missouri Resource Assessment Partnership (MoRAP). 2005. Missouri Land Cover. Raster Digital Data. Missouri Resources Assessment Partnership, Columbia, Missouri.

Nichols, J.R. 2012. Macroinvertebrate Assemblage Composition Along a Longitudinal Multiple Land-Use Gradient in a Midwestern Stream. Master's Thesis. University of Missouri, Columbia. 127 pp.

Parris, J.T. 2000. Temporal Variability in the Physical, Chemical, and Biological Parameters of Hinkson Creek in Response to Changes in Discharge. Master's Thesis, University of Missouri, Columbia. 346 pp.

Paul, M.J. and J.L. Meyer. 2001. Streams in the urban landscape. Annual Review of Ecology and Systematics 32:333-365.

Thom, R.H. and J.H. Wilson. 1980. The Natural Divisions of Missouri. Transactions of the Missouri Academy of Science 14: 9-23.

USEPA. 2011. Total Maximum Daily Load – Hinkson Creek, Boone County, Missouri. U.S. Environmental Protection Agency, Region 7, Lenexa, Kansas. 79 pp.

Submitted by: _____

Sam McCord
Environmental Specialist
Water Quality Monitoring Section
Environmental Services Program

Date: _____

Approved by: _____

Alan Reinkemeyer
Director
Environmental Services Program

AR:smt

c: Irene Crawford, Regional Director, NERO
Trish Rielly, QAPP Project Manager, WPP

Appendix A

Macroinvertebrate Taxa Lists

Hinkson Creek (Spring and Fall 2012)

Bonne Femme Creek (Spring 2012)

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120142], Station #6, Sample Date: 10/10/2012 1:15:00 PM

CS = Coarse; NF = Nonflow; -99 = Presence

ORDER: TAXA	CS	NF
AMPHIPODA		
Hyalella azteca		1
ARHYNCHOBDELLIDA		
Erpobdellidae	-99	
COLEOPTERA		
Dubiraphia		1
Dytiscidae		1
Helichus basalis	2	
Peltodytes		1
Stenelmis	34	2
DECAPODA		
Orconectes virilis		-99
DIPTERA		
Ablabesmyia	2	1
Ceratopogoninae	5	3
Chironomus		7
Cladotanytarsus		1
Corynoneura	6	1
Cricotopus bicinctus	19	3
Cricotopus/Orthocladius	22	1
Cryptochironomus	5	6
Dicrotendipes	16	6
Eukiefferiella brevicalcar grp	1	
Forcipomyiinae	1	
Hemerodromia	2	
Hydrobaenus	1	
Parakiefferiella	1	
Paratendipes	1	
Polypedilum convictum	33	
Polypedilum illinoense grp	8	
Polypedilum scalaenum grp	1	
Procladius		1
Pseudochironomus		1
Rheotanytarsus	2	
Simulium	1	
Stempellinella	1	
Stictochironomus	2	3
Tabanus	-99	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120142], Station #6, Sample Date: 10/10/2012 1:15:00 PM

CS = Coarse; NF = Nonflow; -99 = Presence

ORDER: TAXA	CS	NF
Tanypus		1
Tanytarsus	82	4
Thienemanniella	10	
Thienemannimyia grp.	24	
Tipula	-99	
Tribelos		1
EPHEMEROPTERA		
Acerpenna	1	
Caenis latipennis	199	193
Callibaetis	1	
Procloeon	2	
Stenonema femoratum	27	9
Tricorythodes	1	
LIMNOPHILA		
Ancylidae		12
Lymnaeidae	2	2
Menetus		2
Physella	78	1
ODONATA		
Argia	2	
Enallagma	1	
RHYNCHOBDELLIDA		
Glossiphoniidae	1	
TRICHOPTERA		
Cheumatopsyche	28	
Chimarra	1	
Helicopsyche	2	
Hydroptila	3	
TRICLADIDA		
Planariidae	3	
TUBIFICIDA		
Branchiura sowerbyi	2	4
Tubificidae	14	21
VENEROIDA		
Corbicula	7	18

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120141], Station #5.5, Sample Date: 10/10/2012 11:00:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1	4	25
AMPHIPODA			
Hyalella azteca	3		56
ARHYNCHOBDELLIDA			
Erpobdellidae		1	
COLEOPTERA			
Berosus	2		
Dubiraphia	5	3	9
Dytiscidae			1
Stenelmis	28		
DIPTERA			
Ablabesmyia	3	3	1
Ceratopogoninae	2	8	9
Chironomus		123	
Cladopelma		1	
Cladotanytarsus		1	1
Corynoneura	4		1
Cricotopus bicinctus	67		
Cricotopus/Orthocladius	6	1	
Cryptochironomus	4	6	
Dicrotendipes	6	14	7
Ephydridae	1		
Eukiefferiella brevicalcar grp	1		
Hemerodromia	1		
Labrundinia			3
Parachironomus			1
Parakiefferiella			4
Paratanytarsus			2
Paratendipes	1		
Polypedilum convictum	5		
Polypedilum halterale grp		1	
Polypedilum illinoense grp	3		4
Polypedilum scalaenum grp	1		
Procladius		11	
Rheotanytarsus	4		
Simulium	1		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120141], Station #5.5, Sample Date: 10/10/2012 11:00:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Stempellinella		1	
Stictochironomus		1	
Tabanus	-99		
Tanypus		10	1
Tanytarsus	21	13	2
Thienemanniella	14		
Thienemannimyia grp.	1		
Tribelos			1
Zavreliella		1	
EPHEMEROPTERA			
Acentrella	2		
Acerpenna	1		
Baetis	7		
Caenis latipennis	33	77	6
Callibaetis	5	1	1
Leptophlebiidae			2
Stenonema femoratum	31	1	
Tricorythodes	6		
HEMIPTERA			
Rhagovelia	2		
LEPIDOPTERA			
Crambidae	2		
LIMNOPHILA			
Ancylidae	8		12
Lymnaeidae	3		
Menetus	9	12	108
Physella	20		34
LUMBRICINA			
Lumbricina		1	
MEGALOPTERA			
Sialis		-99	-99
ODONATA			
Argia	17		5
Enallagma			15
Erythemis			-99
Libellula			1
Somatochlora		-99	
RHYNCHOBDELLIDA			

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120141], Station #5.5, Sample Date: 10/10/2012 11:00:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Glossiphoniidae			1
TRICHOPTERA			
Cheumatopsyche	8		
Chimarra	1		
Hydroptila	2		1
Nyctiophylax		1	
Oecetis		1	
Polycentropus	1		
TRICLADIDA			
Planariidae	11		9
TUBIFICIDA			
Branchiura sowerbyi	8	4	
Enchytraeidae	1		
Limnodrilus hoffmeisteri	2		
Tubificidae	34	158	6
VENEROIDA			
Corbicula	31	2	
Pisidiidae	10	5	4

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120140], Station #5, Sample Date: 10/10/2012 9:45:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina	1		13
AMPHIPODA			
Hyalella azteca			31
ARHYNCHOBDELLIDA			
Erpobdellidae	1	1	
COLEOPTERA			
Dubiraphia		1	58
Helichus lithophilus	1		
Scirtidae			8
Stenelmis	199		5
DECAPODA			
Orconectes virilis		-99	
DIPTERA			
Ablabesmyia		1	4
Anopheles			1
Ceratopogoninae	5	6	
Chironomus		28	
Cladotanytarsus	1	2	1
Corynoneura	1		
Cricotopus bicinctus	32		
Cricotopus/Orthocladius	43		5
Cryptochironomus	3	6	
Dasyheleinae	1	1	
Dicrotendipes	14	11	6
Eukiefferiella brevicalcar grp	6		
Forcipomyiinae	3		
Glyptotendipes			2
Labrundinia			4
Microtendipes		1	
Nanocladius	1		
Nilotanypus	1		
Ormosia	3		
Parachironomus			2
Paratanytarsus			30
Paratendipes	31		
Phaenopsectra			1

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120140], Station #5, Sample Date: 10/10/2012 9:45:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum convictum	17		
Polypedilum halterale grp		1	
Polypedilum illinoense grp	3		2
Procladius	1	5	2
Pseudochironomus	1	2	
Simulium	2		
Stempellinella		1	
Stictochironomus	6		
Tanytarsus	52	9	11
Thienemanniella	2	1	1
Tribelos		1	
EPHEMEROPTERA			
Caenis latipennis	43	175	2
Stenacron	1		
Stenonema femoratum	16	5	2
LIMNOPHILA			
Ancylidae	2	2	3
Lymnaeidae			1
Menetus	1		30
Physella	89	3	26
LUMBRICINA			
Lumbricina	7		
LUMBRICULIDA			
Lumbriculidae			2
ODONATA			
Argia	3		2
Enallagma			30
RHYNCHOBDELLIDA			
Glossiphoniidae			4
TRICLADIDA			
Planariidae			21
TUBIFICIDA			
Branchiura sowerbyi	5	2	
Limnodrilus cervix		1	
Tubificidae	133	4	22
VENEROIDA			
Corbicula	17	10	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120139], Station #4, Sample Date: 10/9/2012 4:15:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		4	4
AMPHIPODA			
Hyalella azteca			3
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
COLEOPTERA			
Berosus		1	7
Dubiraphia		1	25
Helichus lithophilus	1		2
Psephenus herricki	2		
Stenelmis	62		9
DECAPODA			
Orconectes virilis	-99	-99	
DIPTERA			
Ablabesmyia		1	3
Ceratopogoninae		14	
Chironomus	10	39	4
Cladotanytarsus		4	
Corynoneura	3	1	10
Cricotopus bicinctus	12	1	2
Cricotopus/Orthocladius	8		
Cryptochironomus	6	7	
Cryptotendipes		1	
Dicrotendipes	5	17	1
Goeldichironomus			1
Limonia	1		
Polypedilum convictum	15		
Polypedilum halterale grp		2	1
Polypedilum illinoense grp	1		4
Polypedilum scalaenum grp	1		
Procladius		2	1
Pseudochironomus		2	1
Rheotanytarsus	1		
Simulium	3		
Stempellinella	2	4	
Stictochironomus		4	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120139], Station #4, Sample Date: 10/9/2012 4:15:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Tabanus	3		
Tanytarsus	12	4	3
Thienemanniella	6	2	
Thienemannimyia grp.	9		1
Tribelos		1	
EPHEMEROPTERA			
Acerpenna	4		
Apobaetis		1	1
Caenis latipennis	334	117	101
Callibaetis		1	2
Centroptilum	2		
Maccaffertium pulchellum	1		
Stenacron	5		
Stenonema femoratum	35	12	6
Tricorythodes	22		
LIMNOPHILA			
Ancylidae	8	3	3
Lymnaeidae			1
Menetus		1	10
Physella	7	4	51
MEGALOPTERA			
Sialis		-99	
ODONATA			
Argia	10		4
Enallagma			14
Gomphus		-99	
Hagenius brevistylus		-99	
Libellula			1
RHYNCHOBDELLIDA			
Glossiphoniidae			2
TRICHOPTERA			
Cheumatopsyche	11		
Chimarra	1		
TRICLADIDA			
Planariidae	6		1
TUBIFICIDA			
Aulodrilus		1	
Branchiura sowerbyi	5	6	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120139], Station #4, Sample Date: 10/9/2012 4:15:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Tubificidae	27	22	8
VENEROIDA			
Corbicula	12	30	4

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120138], Station #3.5, Sample Date: 10/9/2012 3:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		5	4
AMPHIPODA			
Hyalella azteca			12
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Berosus	3	3	
Dubiraphia		2	19
Macronychus glabratus			1
Scirtidae			2
Stenelmis	116	7	
DECAPODA			
Orconectes virilis			-99
DIPTERA			
Ablabesmyia		2	
Ceratopogoninae	2	9	
Chironomus	2	17	
Cladopelma		1	
Cladotanytarsus		2	
Corynoneura	6	1	5
Cricotopus bicinctus	6		
Cricotopus/Orthocladius	5		
Cryptochironomus		11	
Dicrotendipes	9	52	4
Eukiefferiella brevicalcar grp	1		
Forcipomyiinae	5		
Labrundinia			1
Parakiefferiella	1	1	
Paratendipes	1		
Polypedilum convictum	5		1
Polypedilum halterale grp		6	
Polypedilum illinoense grp	2		
Polypedilum trigonum	1		
Procladius		4	
Rheotanytarsus	1		
Simulium	2		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120138], Station #3.5, Sample Date: 10/9/2012 3:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Stempellinella	3	5	
Stictochironomus	1	4	
Tabanus	-99		
Tanytarsus	12	9	1
Thienemanniella	4	1	
Thienemannimyia grp.	49	1	1
Tipula	1		
Tribelos		2	
EPHEMEROPTERA			
Acerpenna	4		
Apobaetis		1	
Caenis latipennis	178	191	21
Callibaetis	1		2
Maccaffertium pulchellum	1		
Procloeon		1	1
Stenacron	12		
Stenonema femoratum	27	7	
Tricorythodes	144		
LIMNOPHILA			
Ancylidae	9	1	44
Lymnaeidae	1		
Menetus	1	5	132
Physella	9		8
ODONATA			
Argia	26	-99	3
Enallagma			28
TRICHOPTERA			
Cheumatopsyche	30	1	
Chimarra	2		
Helicopsyche	1		
Oecetis		1	
TRICLADIDA			
Planariidae	7		1
TUBIFICIDA			
Aulodrilus		4	
Branchiura sowerbyi	14	3	
Limnodrilus cervix	1		
Tubificidae	98	26	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120138], Station #3.5, Sample Date: 10/9/2012 3:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
VENEROIDA			
Corbicula	38	78	

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120137], Station #3, Sample Date: 10/9/2012 1:50:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		13	3
AMPHIPODA			
Hyalella azteca		1	5
ARHYNCHOBDELLIDA			
Erpobdellidae	-99	-99	
COLEOPTERA			
Berosus	8		
Dubiraphia	1		9
Helichus lithophilus			1
Peltodytes			1
Scirtidae			1
Stenelmis	44	1	
DECAPODA			
Orconectes virilis	-99		
DIPTERA			
Ablabesmyia	6	4	2
Ceratopogoninae		7	2
Chironomus	1		
Cladotanytarsus	1	3	
Clinotanypus			1
Corynoneura	10		2
Cricotopus bicinctus	37		1
Cricotopus/Orthocladius	9	1	
Cryptochironomus	2	8	
Dicrotendipes	9	30	6
Diptera		1	
Dolichopodidae	1		
Eukiefferiella	2		
Forcipomyiinae			1
Glyptotendipes			2
Labrundinia	1	1	
Nanocladius			1
Paralauterborniella		2	
Paratanytarsus	1		1
Polypedilum aviceps	4		
Polypedilum halterale grp	1	6	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120137], Station #3, Sample Date: 10/9/2012 1:50:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum illinoense grp	2	1	
Procladius		3	
Rheotanytarsus	3		
Simulium	5		
Stictochironomus	1	1	
Tanytarsus	16	9	5
Thienemanniella	7		2
Thienemannimyia grp.	40		
EPHEMEROPTERA			
Acerpenna	2		
Baetis	8		
Caenis latipennis	269	94	115
Callibaetis			2
Centroptilum	1		
Stenacron	5		1
Stenonema femoratum	44	3	4
Tricorythodes	6		
LIMNOPHILA			
Ancylidae	3	4	11
Gyraulus		2	1
Menetus	5	1	52
Physella	7	-99	24
MEGALOPTERA			
Sialis		-99	
MESOGASTROPODA			
Hydrobiidae	1		3
ODONATA			
Argia	9		7
Enallagma			24
Epitheca (Tetragoneuria)			-99
Erythemis	1		1
Ischnura			2
Libellula	-99		
Progomphus obscurus	1	-99	
RHYNCHOBDELLIDA			
Glossiphoniidae	1		1
TRICHOPTERA			
Cheumatopsyche	4		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120137], Station #3, Sample Date: 10/9/2012 1:50:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Hydroptila	3	1	
Oecetis		1	
Orthotrichia		1	
TRICLADIDA			
Planariidae	10		1
TUBIFICIDA			
Branchiura sowerbyi	2	4	
Quistradrilus multisetosus		3	20
Tubificidae	8	50	16
VENEROIDA			
Corbicula	49	22	-99
Pisidiidae			13

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120136], Station #2, Sample Date: 10/9/2012 11:00:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		1	
AMPHIPODA			
Hyalella azteca			2
ARHYNCHOBDELLIDA			
Erpobdellidae	1	-99	
COLEOPTERA			
Berosus	1	1	
Coptotomus			1
Dubiraphia	1	1	7
Macronychus glabratus			6
Paracymus			1
Scirtidae			2
Stenelmis	51		1
DECAPODA			
Orconectes virilis			1
DIPTERA			
Ablabesmyia		5	2
Ceratopogoninae	1	7	
Chironomus	2	20	1
Cladopelma		3	
Cladotanytarsus	1	7	
Corynoneura			5
Cricotopus bicinctus	10		
Cricotopus/Orthocladius	14		
Cryptochironomus	2	7	
Dicrotendipes	5	26	11
Eukiefferiella brevicalcar grp	10		
Forcipomyiinae	1		4
Glyptotendipes			2
Hydrobaenus	1		
Labrundinia		1	3
Nanocladius			4
Ormosia	1		
Parametriocnemus	3		
Polypedilum convictum	28		
Polypedilum halterale grp	10	3	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120136], Station #2, Sample Date: 10/9/2012 11:00:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum illinoense grp	3		4
Polypedilum scalaenum grp	2		
Procladius		7	
Rheocricotopus	3		
Rheotanytarsus	7		
Smittia		1	
Stictochironomus	2	1	
Tanytarsus	34	10	6
Thienemanniella	19		
Thienemannimyia grp.	27		6
Tipula	1		1
EPHEMEROPTERA			
Acerpenna	36		
Baetis	7		
Caenis latipennis	117	274	18
Callibaetis			2
Procloeon		1	1
Stenacron	2		
Stenonema femoratum	21	3	7
Tricorythodes	63		2
HEMIPTERA			
Belostoma			-99
Corixidae		1	
ISOPODA			
Caecidotea	1		
LIMNOPHILA			
Ancylidae	5		43
Lymnaeidae			2
Menetus	2	2	83
Physella	4	2	13
LUMBRICINA			
Lumbricina	1		
ODONATA			
Argia	5		6
Enallagma			61
Erythemis			-99
Nasiaeschna pentacantha			-99
Neurocordulia			-99

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120136], Station #2, Sample Date: 10/9/2012 11:00:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Somatochlora		-99	
TRICHOPTERA			
Cheumatopsyche	157		
Chimarra	3		
Hydropsyche	1		
Hydroptila	1		2
Oecetis		1	
TRICLADIDA			
Planariidae	47		5
TUBIFICIDA			
Branchiura sowerbyi	5	3	
Limnodrilus cervix		2	
Limnodrilus hoffmeisteri	1		
Quistradrilus multisetosus			1
Tubificidae	34	85	1
VENEROIDA			
Corbicula	13	3	
Pisidiidae	3		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120135], Station #1, Sample Date: 10/9/2012 9:50:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
AMPHIPODA			
Hyalella azteca	1		20
ARHYNCHOBDELLIDA			
Erpobdellidae	-99		
COLEOPTERA			
Dubiraphia		7	17
Scirtidae			2
Stenelmis	36		2
DIPTERA			
Ablabesmyia	2	8	3
Anopheles			1
Ceratopogoninae	1	8	2
Chironomus	6	17	2
Cladotanytarsus	1		1
Clinotanypus			1
Corynoneura	1	5	10
Cricotopus bicinctus	16	3	3
Cricotopus/Orthocladius	26		1
Cryptochironomus	8	17	3
Dicrotendipes	18	39	12
Eukiefferiella brevicalcar grp	2		
Forcipomyiinae	1	2	
Glyptotendipes	9		22
Labrundinia			1
Ormosia			1
Polypedilum convictum	72		2
Polypedilum halterale grp	1	3	3
Polypedilum illinoense grp	2	1	5
Polypedilum scalaenum grp	3		1
Procladius		10	5
Rheocricotopus	1		
Rheotanytarsus	11	1	
Simulium	84		6
Smittia	1	1	
Stictochironomus	14	3	1
Tabanus	-99		
Tanytarsus	41	17	9

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120135], Station #1, Sample Date: 10/9/2012 9:50:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Thienemanniella	10		
Thienemannimyia grp.	26		2
Tipula			1
Tribelos	1		
EPHEMEROPTERA			
Acerpenna	33		
Baetis	43		3
Caenis latipennis	64	53	36
Centroptilum		1	
Procloeon		1	6
Stenacron	19	2	
Stenonema femoratum	9		
Tricorythodes	3		
HEMIPTERA			
Belostoma			1
Corixidae	1		
LIMNOPHILA			
Ancylidae	15	1	4
Lymnaeidae	13	4	1
Menetus	4	1	22
Physella	6	1	3
LUMBRICINA			
Lumbricina	-99		
MEGALOPTERA			
Sialis		-99	
ODONATA			
Argia	5	1	6
Enallagma			2
Libellulidae			1
Macromia		1	
TRICHOPTERA			
Cheumatopsyche	177	1	2
Hydroptila	7		
Oecetis		1	2
TRICLADIDA			
Planariidae	11		6
TUBIFICIDA			
Branchiura sowerbyi	10	1	5

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120135], Station #1, Sample Date: 10/9/2012 9:50:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Limnodrilus cervix		2	
Tubificidae	37	68	4
UNIONIDA			
Unionidae		-99	
VENEROIDA			
Corbicula	20	6	6
Pisidiidae	19		7

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120062], Station #8, Sample Date: 4/3/2012 3:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		2	
AMPHIPODA			
Hyalella azteca			8
COLEOPTERA			
Dubiraphia		1	9
Dytiscidae		2	1
Enochrus			1
Helichus basalis	1		1
Peltodytes		2	
Scirtidae			1
Stenelmis	97		1
DECAPODA			
Orconectes			-99
DIPTERA			
Ablabesmyia			2
Ceratopogoninae	7	14	4
Chaoborus		1	
Chironomidae	6	2	5
Chironomus	2	22	12
Chrysops			1
Cladopelma		1	
Cladotanytarsus	3	9	
Corynoneura	1	3	1
Cricotopus bicinctus	4		2
Cricotopus trifascia	54		2
Cricotopus/Orthocladius	47	8	24
Cryptochironomus		1	
Cryptotendipes		1	
Demicryptochironomus	1		
Dicrotendipes		2	3
Diplocladius	1		1
Diptera		3	
Empididae	1		
Eukiefferiella brevicalcar grp	9		
Glyptotendipes		1	3
Hexatoma	13		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120062], Station #8, Sample Date: 4/3/2012 3:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Hydrobaenus	7	23	34
Micropsectra	2		5
Microtendipes	4	1	9
Nanocladius		1	1
Ormosia		1	
Parachironomus			1
Parakiefferiella	3	3	6
Parametriocnemus	4		
Paratanytarsus		5	39
Paratendipes	2	1	
Pentaneura		1	
Polypedilum trigonum	1	1	1
Procladius		6	3
Psectrocladius			1
Silvius	1		
Simulium	247		
Stictochironomus	7	177	3
Tabanus	-99		
Tanytarsus		1	4
Thienemannimyia grp.	1		
Tipula	-99		-99
Tipulidae	2		
EPHEMEROPTERA			
Acentrella	6		
Caenis latipennis	17	14	51
Procloeon		1	
Pseudocloeon			1
Stenonema femoratum	1		
LIMNOPHILA			
Ancylidae	2		
Physella	5	13	44
ODONATA			
Boyeria			-99
Enallagma			2
Libellula			-99
PLECOPTERA			
Amphinemura	11		
Perlesta	41		3

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120062], Station #8, Sample Date: 4/3/2012 3:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
TRICHOPTERA			
Ceraclea	3		1
Cheumatopsyche	-99		
Helicopsyche	1	1	
Hydroptila	3		1
Ironoquia			1
Oecetis		1	
Pycnopsyche			-99
Triaenodes			4
TUBIFICIDA			
Limnodrilus hoffmeisteri	5	2	1
Tubificidae	6	6	4
VENEROIDA			
Pisidiidae	11	1	5

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120061], Station #7, Sample Date: 4/3/2012 2:00:00 PM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
AMPHIPODA			
Hyalella azteca			4
COLEOPTERA			
Dubiraphia		1	13
Dytiscidae			1
Helichus basalis	1		
Peltodytes			5
Scirtidae			1
Stenelmis	71	2	3
DIPTERA			
Ablabesmyia			5
Ceratopogoninae	12	15	9
Chironomidae	1	5	4
Chironomus	2	71	15
Cladotanytarsus	10	5	
Clinotanypus			1
Cricotopus bicinctus	4	2	2
Cricotopus trifascia	68	1	
Cricotopus/Orthocladius	40	13	13
Cryptochironomus	2	4	
Cryptotendipes		5	2
Demicryptochironomus	2		
Dicrotendipes	4	8	3
Diplocladius	1		
Diptera	1	1	1
Eukiefferiella brevicalcar grp	6		
Glyptotendipes			4
Hexatoma	7	1	
Hydrobaenus	2	7	19
Labrundinia			1
Micropsectra		1	5
Microtendipes			3
Nanocladius			2
Parakiefferiella	1	1	2
Parametriocnemus	1		
Paratanytarsus	2	3	10
Paratendipes	19		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120061], Station #7, Sample Date: 4/3/2012 2:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Pentaneura	1		1
Polypedilum convictum		1	
Polypedilum halterale grp		4	
Polypedilum scalaenum grp	11		
Polypedilum trigonum	1		
Procladius		7	8
Psectrocladius			2
Pseudochironomus	1		
Simulium	293		2
Stictochironomus	29	85	
Tabanus	8		
Tanytarsus		4	
Tipula	-99		
Tipulidae	7	1	
EPHEMEROPTERA			
Acentrella	14		2
Caenis latipennis	32	27	40
Leucrocuta	1		
GORDIOIDEA			
Gordiidae			-99
HEMIPTERA			
Corixidae		1	
LIMNOPHILA			
Ancylidae			1
Lymnaeidae		4	2
Menetus			20
Physella		9	38
LUMBRICULIDA			
Lumbriculidae			1
ODONATA			
Argia			1
Enallagma			4
Progomphus obscurus		1	
PLECOPTERA			
Amphinemura	2		
Perlesta	8	1	2
TRICHOPTERA			
Hydroptila	1		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120061], Station #7, Sample Date: 4/3/2012 2:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Nectopsyche		1	
Oecetis		1	1
Rhyacophila	1		
Triaenodes			2
TUBIFICIDA			
Branchiura sowerbyi			1
Limnodrilus hoffmeisteri	6	2	1
Tubificidae	10	5	3
VENEROIDA			
Pisidiidae	15	3	9

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120060], Station #6.5, Sample Date: 4/3/2012 1:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina			1
AMPHIPODA			
Hyalella azteca			2
COLEOPTERA			
Dubiraphia	5		12
Dytiscidae	1		
Helichus lithophilus			1
Peltodytes		6	
Scirtidae			1
Stenelmis	46	1	5
DECAPODA			
Orconectes			1
DIPTERA			
Ceratopogoninae	4	17	6
Chironomidae	3	9	2
Chironomus	1	67	5
Cladotanytarsus	4	4	1
Clinotanypus		1	1
Corynoneura	6	1	2
Cricotopus bicinctus	13	3	8
Cricotopus trifascia	160		6
Cricotopus/Orthocladius	98	16	30
Cryptochironomus		3	
Cryptotendipes		10	
Demicryptochironomus	1		
Dicrotendipes	5	15	7
Diptera		5	2
Eukiefferiella brevicalcar grp	11		
Hydrobaenus		15	6
Labrundinia			1
Larsia			2
Micropsectra	2	1	1
Microtendipes	1	2	6
Parakiefferiella		7	6
Parametriocnemus	3	1	1
Paratanytarsus	4	12	21

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120060], Station #6.5, Sample Date: 4/3/2012 1:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Paratendipes	2		
Pentaneura	2		
Pericoma		1	
Polypedilum convictum	31		
Polypedilum halterale grp		3	
Polypedilum illinoense grp	1		
Polypedilum scalaenum grp	5		
Polypedilum trigonum		1	3
Procladius		3	9
Rheotanytarsus	2		
Simulium	132		2
Stictochironomus	20	36	1
Tanypus		1	
Tanytarsus	1	14	11
Thienemanniella	1		
Thienemannimyia grp.	7	1	2
Tipula	-99		-99
Zavreliella		1	
EPHEMEROPTERA			
Acentrella	12		6
Baetis	1		
Caenis latipennis	31	46	49
Callibaetis			1
Stenacron	1		
Stenonema femoratum	2		-99
HEMIPTERA			
Microvelia			1
Trichocorixa			1
LIMNOPHILA			
Ancylidae		2	
Lymnaeidae		3	2
Menetus	1	1	
Physella	24	14	24
ODONATA			
Argia	1		1
Calopteryx			1
Dromogomphus			-99
Enallagma			3

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120060], Station #6.5, Sample Date: 4/3/2012 1:00:00 PM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Libellula		-99	1
Progomphus obscurus		-99	
PLECOPTERA			
Perlesta	6		1
TRICHOPTERA			
Ceraclea			4
Helicopsyche	3		1
Hydroptila	2		
Nectopsyche			1
Triaenodes		1	3
TUBIFICIDA			
Aulodrilus		6	
Branchiura sowerbyi		3	
Enchytraeidae	1		
Limnodrilus claparedianus		1	
Limnodrilus hoffmeisteri	3	11	2
Tubificidae	3	19	1
VENEROIDA			
Pisidiidae	25	1	6

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120059], Station #6, Sample Date: 4/3/2012 11:35:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
N/A			
"HYDRACARINA"			
Acarina		1	
AMPHIPODA			
Hyalella azteca			3
ARHYNCHOBDELLIDA			
Erpobdellidae	1	-99	
COLEOPTERA			
Dubiraphia		3	
Helichus basalis			1
Stenelmis	32	3	1
DECAPODA			
Orconectes	1		
DIPTERA			
Ablabesmyia	2		1
Ceratopogoninae	3	3	3
Chironomus	3	19	2
Cladotanytarsus	1	1	
Corynoneura	4		2
Cricotopus bicinctus	32	38	46
Cricotopus trifascia	118	11	15
Cricotopus/Orthocladius	104	39	83
Cryptochironomus		4	
Cryptotendipes		1	
Dicrotendipes	6	24	7
Diplocladius			1
Endochironomus		1	
Eukiefferiella brevicalcar grp	9		4
Hydrobaenus	5	5	10
Labrundinia			2
Micropsectra	1		1
Microtendipes	5		3
Nilotanypus	1		1
Nilothauma		1	1
Parakiefferiella	5	3	5
Parametriocnemus	3		4

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120059], Station #6, Sample Date: 4/3/2012 11:35:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Paraphaenocladius			1
Paratanytarsus	5	8	19
Paratendipes	7		
Pentaneura	3		1
Pilaria		1	
Polypedilum convictum	28		
Polypedilum illinoense grp	2		7
Polypedilum scalaenum grp	1		
Procladius		8	1
Psectrocladius		1	
Rheotanytarsus	2		4
Simulium	364	3	32
Stictochironomus	7	16	1
Sublettea	1		1
Tabanus	-99		
Tanytarsus	3	3	4
Thienemanniella			2
Thienemannimyia grp.	7	1	7
Tipula	-99	-99	1
Tipulidae			1
EPHEMEROPTERA			
Acentrella	1		
Baetis	4		
Caenis latipennis	24	69	26
Hexagenia limbata		-99	
Procloeon		2	
Stenacron		1	
Stenonema femoratum	1		
LIMNOPHILA			
Physella	19	7	41
Planorbidae			1
ODONATA			
Argia	2		2
Dromogomphus		-99	
Enallagma		1	2
Libellula			-99
PLECOPTERA			
Perlesta	1		3

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120059], Station #6, Sample Date: 4/3/2012 11:35:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
TRICHOPTERA			
Cheumatopsyche	-99	-99	1
Helicopsyche	1		
Hydroptila	1		3
Ironoquia			1
TUBIFICIDA			
Branchiura sowerbyi		4	1
Limnodrilus hoffmeisteri	1	7	
Tubificidae	1	6	
VENEROIDA			
Corbicula	4	-99	
Pisidiidae		9	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120058], Station #5.5, Sample Date: 4/3/2012 10:35:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		4	2
AMPHIPODA			
Hyalella azteca			1
COLEOPTERA			
Dubiraphia			7
Enochrus			1
Helichus basalis			2
Peltodytes			1
Stenelmis	66		6
DECAPODA			
Orconectes virilis	1	1	2
DIPTERA			
Ablabesmyia		3	2
Ceratopogoninae	6	6	6
Chironomus	3	143	24
Cladopelma			1
Cladotanytarsus	1	2	
Corynoneura	3		1
Cricotopus bicinctus	113	9	39
Cricotopus trifascia	184		
Cricotopus/Orthocladius	272	12	31
Cryptochironomus	2	2	
Cryptotendipes		6	2
Dicrotendipes	19	10	2
Eukiefferiella brevicalcar grp	28		1
Hydrobaenus		14	9
Microtendipes	2	2	
Nanocladius	2		1
Nilotanypus	2		
Nilothauma	3	4	
Paracladopelma		2	
Parakiefferiella	1	5	4
Parametriocnemus	3		
Paraphaenocladius			1
Paratanytarsus	11	4	8
Paratendipes	2		

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120058], Station #5.5, Sample Date: 4/3/2012 10:35:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Pentaneura	2		2
Polypedilum convictum	34		1
Polypedilum halterale grp	1	4	
Polypedilum illinoense grp	1		1
Polypedilum scalaenum grp	3		
Polypedilum trigonum		1	1
Procladius		19	4
Rheotanytarsus	12		2
Simulium	255		1
Stictochironomus	10	32	2
Tabanus	-99		
Tanytarsus	17	8	11
Thienemanniella	2		
Thienemannimyia grp.	19		5
Tipula	-99		
Xenochironomus	1		
EPHEMEROPTERA			
Baetis	10		
Caenis latipennis	21	8	44
Stenacron	1		
Stenonema femoratum	2		
Tricorythodes	1		
ISOPODA			
Caecidotea			2
LIMNOPHILA			
Ancylidae	3		1
Physella	33	28	40
Planorbella	1		
ODONATA			
Argia	1		
Calopteryx			2
Enallagma			8
Hagenius brevistylus			1
Ophiogomphus			2
Somatochlora			1
PLECOPTERA			
Perlesta	3		1
TRICHOPTERA			

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120058], Station #5.5, Sample Date: 4/3/2012 10:35:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Ceraclea	5		
Hydroptila	16		
Ironoquia			1
Triaenodes			1
TRICLADIDA			
Planariidae	18		
TUBIFICIDA			
Branchiura sowerbyi		1	
Limnodrilus cervix		2	1
Limnodrilus hoffmeisteri	14	10	
Tubificidae	11	16	8
VENEROIDA			
Corbicula	-99		
Pisidiidae	5	21	1

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120057], Station #5, Sample Date: 4/3/2012 9:20:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		11	3
AMPHIPODA			
Crangonyx		1	1
BRANCHIOBDELLIDA			
Branchiobdellida	4		
COLEOPTERA			
Dubiraphia		2	1
Enochrus			1
Stenelmis	28	1	16
DECAPODA			
Orconectes	2		
Orconectes virilis	-99		
DIPTERA			
Ablabesmyia		4	1
Ceratopogoninae		7	1
Chironomidae	6	7	1
Chironomus	2	33	8
Cladotanytarsus	1	12	3
Corynoneura			1
Cricotopus bicinctus	35	13	27
Cricotopus trifascia	110		15
Cricotopus/Orthocladius	50	26	37
Cryptochironomus		3	
Cryptotendipes		4	
Dicrotendipes	13	14	4
Dolichopodidae		1	
Eukiefferiella brevicalcar grp	7	2	1
Hydrobaenus	2	4	9
Labrundinia		1	
Micropsectra	1		
Microtendipes		1	
Nanocladius		1	1
Parakiefferiella	3	14	7
Parametriocnemus	5		1
Paratanytarsus	11	6	6
Paratendipes		1	

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120057], Station #5, Sample Date: 4/3/2012 9:20:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Pentaneura	1	1	4
Polypedilum convictum	53	1	12
Polypedilum halterale grp		4	
Polypedilum illinoense grp			2
Procladius		8	
Rheocricotopus			1
Rheotanytarsus	14	1	7
Simulium	74		12
Stictochironomus		46	
Sublettea			5
Tanytarsus	4	10	6
Thienemanniella	1		1
Thienemannimyia grp.	11	1	11
Tipula	1		1
EPHEMEROPTERA			
Baetis	1		1
Caenis latipennis	65	21	30
Procloeon		1	
Pseudocloeon			1
Stenacron	3		
Stenonema femoratum	3		2
Tricorythodes	2		
HAPLOTAXIDA			
Haplotaxis			1
HEMIPTERA			
Microvelia			4
LIMNOPHILA			
Lymnaeidae		2	
Menetus		1	1
Physella	6	12	46
LUMBRICINA			
Lumbricina	-99		
ODONATA			
Argia	11		1
Enallagma			7
Hagenius brevistylus	-99		
Libellula			-99
TRICHOPTERA			

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120057], Station #5, Sample Date: 4/3/2012 9:20:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Cheumatopsyche	1		
Hydroptila	11		
Leptoceridae		1	
TRICLADIDA			
Planariidae	4		1
TUBIFICIDA			
Branchiura sowerbyi	1	4	
Enchytraeidae			3
Limnodrilus claparedianus		1	
Limnodrilus hoffmeisteri	6	4	
Tubificidae	2	23	3
VENEROIDA			
Corbicula	8	11	5
Pisidiidae	11		

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120056], Station #4, Sample Date: 4/3/2012 8:30:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina		21	2
AMPHIPODA			
Crangonyx	1		
ARHYNCHOBDELLIDA			
Erpobdellidae			1
BRANCHIOBDELLIDA			
Branchiobdellida	1		
COLEOPTERA			
Berosus			1
Dubiraphia	1	1	9
Stenelmis	59	4	2
DECAPODA			
Orconectes virilis	6	-99	
DIPTERA			
Ablabesmyia		3	3
Apedilum			1
Ceratopogoninae	1	1	8
Chironomidae		10	5
Chironomus		22	10
Cladotanytarsus	3	1	2
Corynoneura		3	11
Cricotopus bicinctus	21	14	37
Cricotopus trifascia	49		
Cricotopus/Orthocladius	71	34	51
Cryptochironomus	5	2	
Cryptotendipes		1	3
Dicrotendipes	8	21	7
Diptera	2		
Eukiefferiella brevicalcar grp	11		1
Hydrobaenus		14	11
Labrundinia			1
Microtendipes		1	2
Nanocladius			5
Ormosia	2		
Parachironomus			1
Parakiefferiella	1	17	12

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120056], Station #4, Sample Date: 4/3/2012 8:30:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Parametriocnemus	6		
Paraphaenocladius			2
Paratanytarsus	7	38	42
Paratendipes	3	1	
Pentaneura			2
Phaenopsectra			1
Polypedilum convictum	66		1
Polypedilum halterale grp		3	
Polypedilum illinoense grp	1		1
Polypedilum scalaenum grp	5		
Procladius		9	2
Pseudochironomus			1
Rheotanytarsus	24	2	20
Simulium	169		2
Stenochironomus			1
Stictochironomus	1	26	12
Tabanus	1		
Tanytarsus	3	9	27
Thienemanniella	2		
Thienemannimyia grp.	4	4	10
Tipula	-99		
EPHEMEROPTERA			
Acerpenna	1		
Baetis	6		
Caenis latipennis	36	37	34
Stenacron	3	1	
Tricorythodes	10	1	
ISOPODA			
Caecidotea	1		
LIMNOPHILA			
Physella	1	8	44
ODONATA			
Argia	4	3	2
Boyeria			-99
Enallagma		3	
PLECOPTERA			
Perlesta	1		
TRICHOPTERA			

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120056], Station #4, Sample Date: 4/3/2012 8:30:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Ceraclea			4
Cheumatopsyche	2		
Chimarra	3		
Hydroptila	5	1	
TRICLADIDA			
Planariidae	6		1
TUBIFICIDA			
Branchiura sowerbyi		3	
Enchytraeidae		2	
Limnodrilus claparedianus		2	
Limnodrilus hoffmeisteri		3	
Tubificidae	2	11	3
VENEROIDA			
Corbicula	4		
Pisidiidae	7	5	3

Aquid Invertebrate Database Bench Sheet Report
Hinkson Cr [120055], Station #3.5, Sample Date: 4/3/2012 7:45:00 AM
CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
"HYDRACARINA"			
Acarina			6
COLEOPTERA			
Berosus	2		
Dubiraphia	2	3	2
Dytiscidae			1
Haliplus		1	3
Macronychus glabratus			2
Stenelmis	64	1	
DECAPODA			
Orconectes virilis	-99		3
DIPTERA			
Ceratopogoninae	4	9	1
Chironomidae	14	4	5
Chironomus	1	80	13
Cladotanytarsus	10	2	
Clinotanypus		2	
Corynoneura			1
Cricotopus bicinctus	26	3	51
Cricotopus trifascia	139	1	8
Cricotopus/Orthocladius	147	4	14
Cryptochironomus	4	4	1
Cryptotendipes		23	1
Dicrotendipes	7	8	6
Eukiefferiella brevicalcar grp	11		1
Hexatoma	-99		
Hydrobaenus	2	1	3
Micropsectra			1
Microtendipes			2
Natarsia		1	
Parakiefferiella	1	2	4
Parametriocnemus	2		
Paratanytarsus	9	3	26
Paratendipes		1	
Polypedilum convictum	27		2
Polypedilum halterale grp		4	
Polypedilum illinoense grp			1

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120055], Station #3.5, Sample Date: 4/3/2012 7:45:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Polypedilum scalaenum grp	1		
Procladius		21	8
Rheotanytarsus	4		7
Simulium	58		9
Stictochironomus	1	6	1
Tanypus		1	
Tanytarsus	1		7
Thienemanniella	1		
Thienemannimyia grp.	4	2	14
Tipula	1		
EPHEMEROPTERA			
Acentrella	1		1
Baetis	4		
Caenis latipennis	52	43	75
Stenonema femoratum			1
Tricorythodes	14		
ISOPODA			
Caecidotea		1	1
LIMNOPHILA			
Ancylidae	3		
Physella		3	24
ODONATA			
Argia	1		6
Enallagma			10
Epitheca (Epicordulia)			1
Hagenius brevistylus			-99
PLECOPTERA			
Perlesta	2		
TRICHOPTERA			
Ceraclea			5
Cheumatopsyche	1		
Hydroptila	7		2
TRICLADIDA			
Planariidae	2		
TUBIFICIDA			
Branchiura sowerbyi	4	5	
Limnodrilus claparedianus	4	19	
Limnodrilus hoffmeisteri	57	28	4

Aquid Invertebrate Database Bench Sheet Report

Hinkson Cr [120055], Station #3.5, Sample Date: 4/3/2012 7:45:00 AM

CS = Coarse; NF = Nonflow; RM = Rootmat; -99 = Presence

ORDER: TAXA	CS	NF	RM
Tubificidae	30	73	2
UNIONIDA			
Unionidae	1		
VENEROIDA			
Corbicula	47	7	8
Pisidiidae	3		2